DOCUMENT RESUME

ED 427 658 IR 019 177

AUTHOR	D'Halluin, Chantal; Rethore, Stephane; Vanhille, Bruno; Vieville, Claude
TITLE	Designing a Course on the WEB: The Point of View of a Training Institute.
PUB DATE	1996-10-00
NOTE	9p.; In: WebNet 96 Conference Proceedings (San Francisco, CA, October 15-19, 1996); see IR 019 168.
AVAILABLE FROM	Web site: http://aace.virginia.edu/aace/conf/webnet/html/127.htm
PUB TYPE	Reports - Descriptive (141) -- Speeches/Meeting Papers (150)
EDRS PRICE	MF01/PC01 Plus Postage.
DESCRIPTORS	Computer Assisted Instruction; *Computer Mediated Communication; *Computer Software Development; Cooperative Learning; *Courseware; Distance Education; Educational Technology; Educational Theories; Foreign Countries; Global Approach; Information Technology; Institutes (Training Programs); Instructional Design; Interaction; Models; Postsecondary Education; Theory Practice Relationship; Training; *World Wide Web
IDENTIFIERS	France; *Learning Environments

ABSTRACT

This paper presents a methodology of courseware development that aims to build a global system of training on the Internet. Although the researchers' practice is based on a mix of constructivist and cooperative learning theory, it is noted that courseware would have to support other theories and practices in order to be transferable. Three spaces in which the activities of learners take place are identified--information space, action space, and communication space; the communication space depends on the institute and organizes the interactivity between the different spaces to correspond to a pedagogical practice. Following an introduction to the educational context of the project, these spaces are characterized according to technical and pedagogical points of view. Point-to-point asynchronous communication, group asynchronous communication, and interaction between the three spaces are also discussed. (Contains 11 references.) (DLS)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 427 658

Designing a Course on the Web: The Point of View of a Training Institute

Chantal D'Halluin
Stephane Rethore
Bruno Vanhille
Claude Vieville

Presented at WebNet 96 San Francisco, CA October 15-19, 1996

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
G.H. Marks
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

IR019177

Designing a Course on the WEB : the Point of View of a Training Institute

Chantal D'Halluin, Stéphane Réthoré, Bruno Vanhille, Claude Viéville
CUEEP - Universite des Sciences et Technologies de Lille
Bat. B6 - Cité Scientifique
59655 Villeneuve d'Ascq Cedex - France
Email. : Chantal.Dhalluin@univ-lille1.fr

Abstract: As an institute of open and distance training, our challenge is to offer to our audience an integrated service (course material, training paths, activities, tuition) then to change information exchanges into learning activities. This paper presents a methodology of courseware development which aims to build a global system of training. To produce the design, we distinguish three spaces : information space, action space and communication space. The shape of the communication space must take into account the available facilities to allow the adaptation of the courseware to the pedagogical practice of each training institute. This is a determining factor in the transferability and usability of a courseware.

Introduction

This paper presents a methodology of courseware development which aims to build a global system of training on the Internet. What attracts the Internet to an educational institute is a large communication network to exchange information in two ways, the on-line browser and the courseware package distribution. So the challenge we have to face is to change information exchanges into learning activities. For this reason, we are interested in second generation servers [Andrews et al. 1995] which respond better to educational needs : better interactivity between video-clip, text, images, and so on ; enabling re-use of all the supports we have developed in a fully integrated manner ; inclusion of graphics and formulae is compulsory for a lot of curricula ; embedded courseware corresponds with the multiplicity of training pathways for individualised training and the ease of navigation required. As a minimum requirement, the system needs communication facilities to enhance real collaboration between users and tutors. In the EONT project, in which we are participating, we are verifying these hypotheses. We have to offer, free of charge, on-line courseware which could be re-used by other institutes, but we must also offer integrated services to our own audience. Moreover, our practice is based on a mix of constructivist and cooperative theory of learning, but the courseware have to support other pedagogical theories and practices in order to be transferable. Therefore to develop our system we distinguish three spaces in which the activities of learners take place : information space, action space and communication space. The communication space depends on the institute, and organises the interactivity between the different spaces to correspond to a pedagogical practice. After a short introduction of educational context of our institute and the content of our project, we characterise the information, action and communication spaces according both technical and pedagogical points of view.

The Educational Context

CUEEP (Centre Universite-Economie d'Education Permanente) is an institute of the University of Sciences and Technologies of Lille in northern France which is concerned with several activities: further education for adults, research into educational engineering (open learning and new communication technologies), transfer within the context of new technologies in education.

The audience of the institute ranges from adults who are unable to count to those who want to get higher education. About 20,000 people attend courses every year, either as a means of improving their general qualifications or to benefit from professional training.

Since the late 70's, we have introduced new learning technologies and important work has been done in

designing and experimenting courseware in traditional situations or in distance education and also in research and development of new tools with the help of European programs like DELTA where a system of cooperative learning (the Co-Learn project) [Kaye 1992] has been designed and experimented.

Since the late 80's, we have set up an open and distance system mixing several modes of training (group, individualised, distance, self-training in resource centre [D'Halluin and Vanneste 1995a]). At the moment, people who are registered in distance education are principally those who take a specific examination for adults equivalent to the baccalaureate. They learn from multimedia course material (written paper, audio-tape, video-tape, courseware) and they are in contact with a tutor by phone, fax and Minitel.

Some experiments of the cooperative system Co-learn had been set up during these two last years [Derycke and D'Halluin 1995]. Now we search to integrate this communication system into our distance education organisation.

To continue our work of research into the use of tools of communication in distance education we are setting up a project to design a course on the Web. We have chosen to put on-line a mathematics course whose topic is elementary differential and integral calculus. We have made this choice for several reasons :

This is a compulsory part of the path to scientific higher education. Almost all adults who want access must pass this course - therefore we think that it is important to make it available.

A multimedia package has already been developed (written course, video and software). We plan to use these different support materials within the new course.

The kinds of knowledge are representative of those which the audience of our institute have to acquire when they take a course in our institute. That is to say we find three kinds of knowledge : conceptual and factual knowledge (e.g. the concept of derivation-integration, limits, etc.), procedural knowledge (how to draw the chart of variations in a function ?), strategic knowledge (how to choose the procedure to solve a problem) [Paquette 1994].

Moreover, for about twenty years we have set up an innovative method of teaching/learning mathematics : the "mathematization" of problem-situations [D'Halluin and Poisson 1988] - more a matter of doing mathematics rather than learning mathematics. The learner appropriates him/herself to the content (conceptual or factual knowledge) through mathematical activities (procedural and strategic knowledge).

Six years ago, we faced the following challenge : is it possible in distance learning to develop interactive multimedia course material which : allows the learner to make his/her own way ; give them the initiative to build their own knowledge ; provides the necessary help ; brings synthesis, formalism and the theory required to elaborate academic knowledge [Vanhille 1995] ?

Now in this project we are taking into account the particularities of the new tool (the Web) and we hope that we will be able to meet the following challenge : is it really possible to teach/learn mathematics by doing mathematics using the Web ?

The Methodology for Designing a Course

As the Web is essentially a tool to retrieve information and the interactivity between user and machine is not very easy to create and because we attach much importance to activities of learners in our roles as teachers in charge of a training institute, we have been led to distinguish three spaces to design a course : the information space, the action space, the communication space.

In the next section we describe the features of each space, then we study how each space has to match with the other two to make a coherent global system. We examine these parts in reference to a model of educational situations and learning activities [Derycke and Kaye 1993]. According this model, a situation is seen from different viewpoints (cognitive, organisational, communicational, technical). In

particular, the organisational point of view identifies the agents, the roles, the relationships and the resources.

The Information Space

According to the cognitive point of view, the factual and conceptual knowledge takes place in the information space. In our course, they are introduced from a pseudo-real situation (to introduce the derivation-integration concept, the situation is represented by the measures of distance and speed of a car depending on time).

Information about a concept does not progress linearly and is not static : therefore information is given through on-line browsers in a hypermedia mode which may be reached by using languages such as Java or HM-Card [Andrews et al. 1995a] to include a dynamic aspect for animation.

Interactions are forecasted to involve the user. The aim of these interactions is to maintain the attention of the user to help them understand by asking for some details or verification. The user has to remain active. The actions of the user can be characterised by the verbs : to read, to listen to, to look at, to navigate, to answer, to re-do.

By navigating from anchor to anchor, a learner may loose him/herself in the information space. Like any learning activity, the information space should be strongly structured and a learner must know at all times where they are in this global structure. This is possible by using a server like Hyper-G [Andrews et al. 1995]. We need to provide the learner with an automatically updated map to show the path along which they have travelled. With this higher interactivity level, will be the possibility for each leaner to influence the information by annotating or creating new links to personalise their space. To achieve his/her learning objectives, a self-studying learner has to be able, from the information and his interactions, to create his/her own learning activities.

The Action Space

According to the cognitive point of view, the procedural and strategic knowledge takes place in the action space. It is also the space of some meta-knowledge, which is closely linked to the self-assessment.

We can distinguish two kinds of activities proposed in this space : those linked to the content and those about self organisation of learning. They need different tools to be achieved. The activities linked to content are : solving problems (e.g. an optimisation problem) ; training exercises (e.g. drawing a variation table from a graph) ; specifics activities on didactic software (e.g. finding symmetries, translation, etc. which transform a curve into another one) ; and free activities which the learner should initialise by themselves.

They need to use standard office automation software available on the local station , specific files for standard software sent by the server or selected from the information space, transferred packages (an environment composed of software and files which provide the learner with tools, help and results which are useful in resolving a problem and controlling their work) and transferred didactic software linked to a specific objective of learning.

To organise their own training, a learner has to capitalise their work and knowledge by obtaining the results of their activities in the action space. Then they can test their skills and readjust their learning path. Therefore the system has to provide the learner with guidance tools to allow self-assessment and self-control of their course. These will include a hypermedia library which will be filled up by the user, tables of objectives, maps of typical prepared learning paths and an empty map to describe their own route.

After a first analysis, taking into account our academic training context, our opinion is mixed. One of our concerns is that there may be confusion between the information provided by the server and transformations of this primary structure which take place when the user performs actions. Such possibilities could be very useful for the learner to make their own libraries from the information without

modifying the server. Another concern is that the two-way transmission between learner and server in the communication space should be as efficient as possible to enhance collaborative learning.

The Communication Space

In order to support an educational process with remote learners, we have to provide communication facilities.

According to the cognitive point of view, strategic knowledge and meta-knowledge take place in the communication space. The actions of a learner can be characterised with three types. The first type is relative to the socialisation : to set up a learning group in the perspective of collaborative work ; the second one is relative to facilitate the pedagogy : to regulate the training, to organise meetings, to exchange, to comment ; the third one is relative to the learning process : to use expertise from tutors or other learners, to debate, to ratify hypotheses, to make decisions, to validate the training.

This communication connects two people (tutor/learner or learner/learner) or a group with or without tutor. Communication can be synchronous or asynchronous.

In our educational practice, we have tested several tools of communication and their uses. We have concluded that the use of several tools is needed to make distance-training successful [D'Halluin 1995b]. According to the use of bi or multi-points, and synchronous or asynchronous communication, their functions are not the same. For example, it is difficult to conclude a scientific debate between learners being in real-time conference, while the report would be produced with an asynchronous conference. The tutor can bring personalised tuition in both modes of communication. Real-time communication facilities like videoconferencing systems have been experimented with during the two last years. We concluded they form no more than 5% of the total communication facilities usage time. The three major reasons are :

- real-time communication puts time constraint on the users;
- real time communication is expensive;
- the communication is rich but not persistent.

Due to these reasons, the current experimentation will only use asynchronous communication in a point to point or group mode.

Point to Point Asynchronous Communication

Electronic mail, by providing an excellent "round trip" time between the tutor and learner, allows more interaction than classical mail ("snail mail") which does not favour a clear separation between the information space and the activity space. In an email system as the messages are stored, they can be referenced and "discussion" can be supported. A negotiation of the condition in which the activities can be done is possible.

Asynchronous communications are cheap and technology is now mature. The institution needs a computer with a mailing system often included in the operating system(e.g. Unix or Windows NT). All that needs to be set up is a group of analogue telephone lines to allow connections from remote learners who only need to add a modem to their personal computers.

Another way of supporting "point to point" communication is to offer annotation on the documents which are on-line. Public or group annotations which can be put on documents from a Web server is an efficient learning tool. Both tutors and learners can add comments to on-line documents.

Efficient systems also have to support "guided tours" of both the information and action spaces. So the tutor can prepare a sequence of work for a specific learner and both tutor and learner can see all the documents which have been "loaded" and read. With this method the learner can discover the current state of a task they have to perform, and the tutor is able to obtain a rapid overview of the learner's work.

These facilities are not yet available on traditional Web servers. Training institutions need to set up specific servers to support these functions. The Hyper-G server developed at the university of Graz already offers these facilities.

From our own experience of the asynchronous communication facilities, we have observed that it still remains difficult for users to support several simultaneous exchanges. The subject field of the email is often the only way to discriminate and to construct a thread of the conversation. In the next section we will continue this discussion as these difficulties will dramatically increase with group communication.

Group Asynchronous Communication

If the tutors encourage collaborative work between learners, the traditional mail is not sufficient. One can use email, but even with the use of list servers to allow multicast within a group, the system do not really help the users to maintain "conversation threads". They use a tree-like classification of messages, by making folders and using sort facilities of the mailing system.

Attachment of documents is possible and standards like MIME allow interoperability between the different client applications which manage the mail.

Dedicated group communication systems have been available for more than twenty years. They provide an automatic way of :

- broadcasting messages amongst a group
- classifying messages in a tree-like structure
- managing conversation threads

Nevertheless, most of these products do not provide a way of structuring the conversation [Hiltz, Turroff 1985] and the computer cannot help the users to get overviews of the group discussion.

In the Co-Learn project, we experimented with a group communication system (based on the speech act theory) which can support collaborative activities within a group. The system offers the user several patterns of conversation dedicated to specific goals. For example, if the tutor needs to negotiate an action (in the action space) with a learner, he selects the appropriate action pattern and he fills in a form which contains the fields dedicated to this negotiation : aim, deadline, etc..

The reader who is interested in obtaining details of experiments into such systems in education should read [Viéville 1995].

Interaction Between the Three Spaces

To distinguish the three spaces we introduced before, is a strategy of courseware development based on transferability. This takes place into the continuum of new learning modes. The first case is face to face learning, where nothing is transferable so the three spaces are indistinguishable. The next case is individualised learning or second generation distance education, for which information and action spaces need mediated supports (papers, audio and video tapes, software), but they are also indistinguishable. Communication modes and collaborative activities are responsibilities of the tutor. However in this case, we encounter a lot of difficulties when transferring our supports to other institutes, since they are dedicated to a particular model of learning. In our case the model is "learning by doing". The institute which wants to integrate our materials into its practice has to agree with this theoretical model, such an agreement is a condition of the transfer.

By distinguishing communication and then information and action spaces, a multiplicity of approaches to the same content are possible : entering by the information space proposes a transmissive practice ; entering by the action space refers to the constructivist learning model ; entering by the communication space between learners enhances a collaborative and social training. Action and information spaces should be re-used by another institute if services are proposed in the communication space. The two way communication between server and client and the possibility to manage author rights at different levels

for each component of the initial proposed structure, make it possible for an institute to transform links and structure courseware to its own practice. That means transforming the interactivity between spaces to propose new routes, to enter another objective table, to modify or to enrich the information space in the aim of increasing coherence between spaces and between courseware and practice. What finally makes consistency of the whole are the services proposed by the institute in the communication space. Those services organise the user's learning activities which necessarily develop themselves through the three spaces.

From the learner's point of view, the user often has to move from one space to another to develop his learning activity, and may need to open two spaces simultaneously. For example : the learner needs this flexibility to pick out files or pages from the information space and to transfer them into his own library in the action space ; to research information to solve a problem ; to transfer personal work to other users from the action space through communication space ; to display their objective table or personal map while navigating in the information space ; to discuss at a distance with the tutor about personal work. So must this distinction between spaces be transparent or visible to the learner ? We chose to make it visible . The roles and activities of the user are different in each space. In the first space we identified, they are a reader who receives information, annotates, classifies information, etc.. In the action space, they are an individual learner who solves problems, trains themselves, tests themselves, directs themselves, etc.. In the communication space, they are a social learner who learns academic knowledge with and from others (students and tutors) in a socially organised structure, by debating, by submitting work for the analysis of the others, by proposing hypotheses and so on. Therefore, making the structure visible may help the user to structure his own learning activity which is so important in all individualised or distance learning. A metaphor still needs to be defined to provide the best possible usability of the global system without a long period of training.

Conclusion

In this paper we have dealt with conditions to develop an open and flexible course. Several points have arisen, like the accessibility of resources to a user - some can be free, others require fees. It would be useful to put a virtual tutor on line to guide each learner.

The implementation is evolving from a dedicated solution (Co-Learn project) to a standard solution using second generation systems like Hyper-G which provide a good interface with existing training institution administrative databases with a SQL gateway. Moreover, we are also working to define the interface between the course delivery platform and the production team which also includes teachers.

What we mean by an open and flexible course is a course based on adaptability of available resources, adaptability of communications and a more adaptable structure.

We want the course to be adaptable to different pedagogical strategies (constructivist, transmissive, collaborative and mixtures of them), to different subjects (kinds of knowledge other than mathematics), to different technologies (particularly interoperability problems), to provisions and delivery systems of different institutes. One should be able to measure the efficiency of system in measuring their degree of adaptability.

References

[Derycke and D'Halluin 1995] Derycke, A., D'Halluin, C.(1995). *Co-operative learning in the distance education of adults: why, how and first results from the CO-Learn project*, in Innovative Adult Learning with new Technologies (A-61) B. Collis and G. Davies Editors, IFIP 1995.

[D'Halluin and Poisson 1988] D'Halluin, C., Poisson, D.; (1988) *Une statégie d'enseignement des mathématiques : la mathématisation de situations*, Thèse de doctorat, Lille,France

[Kaye 1992] Kaye, A.(1992). *Identification of Educational Situations,* in *Co-Learn project D2005, Representation models for collaborative educational situations and collaborative learning activities.*

[Paquette 1994] Paquette, G.(1994), *Modélisation des connaissances à des fins de formation*, LICEF, tele-Universite, Quebec.

[Vanhille 1995] Vanhille, B.(1995). *un apprentissage à distance fondé sur la résolution de situations problèmes Entretiens Internationaux EAD*, Futuroscope Poitiers, France.

[Derycke and Kaye 1993] Derycke, A., Kaye, A. (1993). *Participative modelling and design of collaborative distance learning tools in the CO-LEARN project, Teleteaching* (A-29) G. Davies Editor, Trondheim, Norway.

[Andrews et al. 1995] Andrews, K., Nedoumov, A., Scherbakov, N. (1995). *Embedding courseware into the Internet : problems and solutions, Proceedings of Ed-Media 95*, Graz, Austria, pp 69-74.

[D'Halluin 1995b] D'halluin, C. (1995) *La présence à distance, c'est possible ou d'un bon usage des medias, Entretiens Internationaux EAD*, Futuroscope Poitiers, France.

[D'Halluin and Vanneste 1995a] D'halluin, C., Vanneste, A. (1995). *Benefits of a distance mode within an open and flexible system, 17th ICDE*, Birmingham, Vol 2, pp 404-407.

[Hiltz and Turroff 1985] Hiltz, S., Turroff, M. (1985). *Structuring Computer-Mediated Communication Systems to Avoid Information Overload*, Comm. *ACM*, Vol. 28, N°7, pp 680-689.

[Viéville 1995] Viéville C. (1995). *Structuring conversation in asynchronous communication systems to support collaborative learning at a distance*. Telematics for Education and Training, Held & Kugemann.